

WHAT IS CLAIMED IS:

1. A method of forming a porous material layer, comprising:
 - 5 forming a material layer containing impurities on a substrate, wherein the impurities are reactive with water molecules; and
 - heating the material layer under a pressure exceeding one atmosphere and in the presence of water vapor to generate pores in the material layer.
- 10 2. The method of claim 1, wherein the material layer is an insulating layer.
3. The method of claim 2, wherein the material layer is inorganic.
- 15 4. The method of claim 2, wherein the insulating layer is formed of at least one of borophosphosilicate (BPSG) glass, borosilicate glass (BSG), phosphosilicate glass, fluorinated BPSG, and fluorinated BSG, and wherein the impurities are at least one of boron atoms and phosphorus atoms.
- 20 5. The method of claim 1, wherein said heating the material layer comprises heating the substrate to a temperature in the range of 85 degrees Celsius to 150 degrees Celsius.
6. The method of claim 1, wherein a humidity of the water vapor is 85% to 100%.

7. The method of claim 1, wherein the pressure is 2 atmospheres to 5 atmospheres.

8. The method of claim 1, wherein the pores are formed by ejection 5 of the impurities that react on the water molecules of the water vapor.

9. The method of claim 1, further comprising, after forming the pores, baking the material layer to remove water that exists in the material layer.

10. The method of claim 9, wherein said baking is performed using a hydrogen gas and a nitrogen gas as ambient gases and by heating the substrate to a temperature of 350 degrees Celsius to 400 degrees Celsius.

15. The method of claim 9, further comprising irradiating the baked material layer with ultraviolet rays to remove any silanol groups existing in the baked material layer.

12. A method of fabricating a semiconductor device comprising:
20 forming an interlayer insulating layer on a semiconductor substrate, the interlayer insulating layer containing impurities that are reactive with water molecules;

loading the substrate having the interlayer insulating layer into a chamber;

25 introducing pressurized water vapor into the chamber and

simultaneously heating the substrate to generate pores in the interlayer insulating layer;

baking the interlayer insulating layer having the pores using a hydrogen gas and a nitrogen gas as ambient gases to remove water that exists
5 in the interlayer insulating layer; and

forming metal interconnection lines using a dual damascene process
in the baked interlayer insulating layer.

13. The method of claim 12, wherein the interlayer insulating layer
10 is inorganic.

14. The method of claim 12, wherein the interlayer insulating layer
is formed of at least one of borophosphosilicate (BPSG) glass, borosilicate
glass (BSG), phosphosilicate glass, fluorinated BPSG, and fluorinated BSG.

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15. The method of claim 12, wherein a humidity of the water vapor
is 85% to 100%.

16. The method of claim 12, wherein the water vapor is pressurized
20 in the range of 2 atmospheres to 5 atmospheres.

17. The method of claim 12, wherein the substrate is heated to a
temperature of 85 degrees Celsius to 150 degrees Celsius during the
generation of pores.

18. The method of claim 12, wherein the pores are formed by ejection of the impurities that react on the water molecules of the water vapor.

5 19. The method of claim 12, further comprising, prior to formation of the metal interconnection lines, irradiating the baked interlayer insulating layer with ultraviolet rays to remove silanol groups that exists in the baked interlayer insulating layer.

10 20. The method of claim 12, wherein the metal interconnection lines are formed of copper.